

Michael Gene Giacomelli

Research Scientist

Department of Electrical Engineering and Computer Science
 Research Lab of Electronics, Massachusetts Institute of Technology
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Education

08/06 – 07/12	Ph.D.	Duke University , Durham NC Biomedical Engineering
08/06 – 01/12	M.S.	Duke University , Durham NC Electrical Engineering
08/02 – 05/06	B.S.	University of Arizona , Tucson, AZ Computer Engineering
08/02 – 05/06	B.S.	University of Arizona , Tucson, AZ Computer Science

Postdoctoral Training

02/17 – Present	Research Scientist Research Laboratory of Electronics, MIT Supervisor: Prof. James Fujimoto, Ph.D.
02/14 – 02/17	NIH NRSA Postdoctoral Fellow Research Laboratory of Electronics, MIT Supervisor: Prof. James Fujimoto, Ph.D.
09/12 – 01/14	Postdoctoral Associate Research Laboratory of Electronics, MIT Supervisor: Prof. James Fujimoto, Ph.D.

Predocloral Research and Work Experience

08/06 – 07/12	Research Assistant Fitzpatrick Institute of Photonics, Duke University Advisor: Prof. Adam Wax, Ph.D.
06/09 – 08/11:	Summer of Code Project Mentor Google, Inc.
06/07 – Present:	Developer/Project Leader, Rockbox open source embedded operating system
01/05 – 07/06:	Undergraduate Research Fellow, Ecology and Evolutionary Biology, University of Arizona Advisor: Prof. Joanna Masel, Ph.D.
08/02 – 01/05:	Network Technician Digital Solutions, Inc., Tucson Arizona. Supervisor: Gil McLaughlin

Research Interests

- Nonlinear and confocal microscopy
- Optical coherence tomography (OCT)
- Intraoperative imaging and Mohs surgery

- Digital pathology
- Fluorescence lifetime imaging (FLIM)
- Light scattering and spectroscopy
- Optical design and prototyping
- GPU, parallel and distributed computing
- Digital image processing

Editorial Activities

Ad Hoc Reviewer:	Scientific Reports, Cancer Research, Optics Express, Optics Letters, Journal of Biophotonics, Biomedical Optics Express, Journal of the Optical Society of America A
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Professional Service

2017 – Present	Program Committee, OSA Biomedical Topical Meeting "Microscopy, Histopathology, and Analytics".
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Teaching Experience

2012 – Present	MIT Optics and Photonics Lecture, "Lens system design using Zemax"
2008 – 2010	Supervised 3 TAs and instructed laboratory course on biomedical instrumentation

Publications and Invited Presentations

Journal Articles (H-index: 13, I-10 Index: 18)

1. L. C. Cahill, **M. G. Giacomelli**, T. Yoshitake, H. Vardeh, B. E. Faulkner-Jones, J. L. Connolly, C. Sun, and J. G. Fujimoto, "Rapid virtual H&E histology of breast tissue specimens using a compact fluorescence nonlinear microscope," *Laboratory Investigation*, In Press.
2. K. Liang, O. O. Ahsen, Z. Wang, H.-C. Lee, W. Liang, B. M. Potsaid, T.-H. Tsai, **M. G. Giacomelli**, V. Jayaraman, H. Mashimo, X. Li, and J. G. Fujimoto, "Endoscopic forward-viewing optical coherence tomography and angiography with MHz swept source," *Optics Letters* 42, 3193 (2017).
3. H.-C. Lee, O. O. Ahsen, K. Liang, Z. Wang, M. Figueiredo, **M. G. Giacomelli**, B. Potsaid, Q. Huang, H. Mashimo, and J. G. Fujimoto, "Endoscopic optical coherence tomography angiography microvascular features associated with dysplasia in Barrett's esophagus: a pilot study," *Gastrointestinal Endoscopy* (2017).
4. T. Yoshitake, **M. G. Giacomelli**, L. C. Cahill, D. B. Schmolze, H. Vardeh, B. E. Faulkner-Jones, J. L. Connolly, and J. G. Fujimoto, "Direct comparison between confocal and multiphoton microscopy for rapid histopathological evaluation of unfixed human breast tissue," *Journal of Biomedical Optics* 21, 126021 (2016).
5. **M. G. Giacomelli**, L. Husvogt, H. Vardeh, B. E. Faulkner-Jones, J. Hornegger, J. L. Connolly, and J. G. Fujimoto, "Virtual Hematoxylin and Eosin Transillumination Microscopy Using Epi-Fluorescence Imaging," *Plos One* 11, e0159337 (2016).
6. **M. G. Giacomelli**, Y. Sheikine, H. Vardeh, J. L. Connolly, and J. G. Fujimoto, "Rapid imaging of surgical breast excisions using direct temporal sampling two photon fluorescent lifetime imaging," *Biomedical Optics Express* 6, 4317 (2015).

7. K. Liang, G. Traverso, H.-C. H.-C. Lee, O. O. Ahsen, Z. Wang, B. Potsaid, **M. G. Giacomelli**, V. Jayaraman, R. Barman, A. E. Cable, H. Mashimo, R. Langer, and J. G. Fujimoto, "Ultrahigh speed *en face* OCT capsule for endoscopic imaging," *Biomedical Optics Express* 6, 1146 (2015).
8. O. O. Ahsen, H.-C. H.-C. Lee, **M. G. Giacomelli**, Z. Wang, K. Liang, T.-H. T.-H. Tsai, B. Potsaid, H. Mashimo, and J. G. Fujimoto, "Correction of rotational distortion for catheter-based *en face* OCT and OCT angiography," *Optics Letters* 39, 5973 (2014).
9. T.-H. T.-H. Tsai, H.-C. H.-C. Lee, O. O. Ahsen, K. Liang, **M. G. Giacomelli**, B. Potsaid, Y. K. Tao, V. Jayaraman, M. Figueiredo, Q. Huang, A. E. Cable, J. G. Fujimoto, and H. Mashimo, "Ultrahigh speed endoscopic optical coherence tomography for gastroenterology," *Biomedical Optics Express* 5, 4387 (2014).
10. T.-H. T.-H. Tsai, O. O. Ahsen, H.-C. H.-C. Lee, K. Liang, M. Figueiredo, Y. K. Tao, **M. G. Giacomelli**, B. Potsaid, V. Jayaraman, Q. Huang, A. E. Cable, J. G. Fujimoto, and H. Mashimo, "Endoscopic Optical Coherence Angiography Enables 3-Dimensional Visualization of Subsurface Microvasculature," *Gastroenterology* 147, 1219–1221 (2014).
11. T. E. Matthews, **M. G. Giacomelli**, W. J. Brown, and A. Wax, "Fourier domain multispectral multiple scattering low coherence interferometry," *Applied Optics* 52, 8220 (2013).
12. S. Yarmoska, S. Kim, **M. G. Giacomelli** & A. Wax. "A Calibration Standard for Two-Dimensional Angle-Resolved Low-Coherence Interferometry." *Optical Molecular Probes, Imaging and Drug Delivery* (2013).
13. A. Wax, **M. G. Giacomelli**, T. E. Matthews, M. T. Rinehart, F. E. F. E. Robles, and Y. Zhu, "Optical Spectroscopy of Biological Cells," *Advances in Optics and Photonics* 4, 322 (2012).
14. **M. G. Giacomelli** and A. Wax, "Imaging Contrast and Resolution in Multiply Scattered Low Coherence Interferometry," *IEEE Journal of Selected Topics in Quantum Electronics* 18, 1050–1058 (2011).
15. **M. G. Giacomelli** and A. Wax, "Imaging beyond the ballistic limit in coherence imaging using multiply scattered light," *Optics Express* 19, 1285–1287 (2011).
16. K. J. Chalut, K. Kulangara, **M. G. Giacomelli**, A. Wax, and K. W. Leong, "Deformation of stem cell nuclei by nanotopographical cues," *Soft Matter* 6, 1675 (2010).
17. Y. Zhu, **M. G. Giacomelli**, and A. Wax, "Fiber-optic interferometric two-dimensional scattering-measurement system," *Optics Letters* 35, 1641 (2010).
18. **M. G. Giacomelli**, Y. Zhu, J. Lee, and A. Wax, "Size and shape determination of spheroidal scatterers using two-dimensional angle resolved scattering," *Optics Express* 18, 14616–14626 (2010).
19. **M. G. Giacomelli**, K. J. Chalut, J. H. Ostrander, and A. Wax, "Review of the Application of T-Matrix Calculations for Determining the Structure of Cell Nuclei With Angle-Resolved Light Scattering Measurements," *IEEE Journal of Selected Topics in Quantum Electronics* 16, 1–9 (2009).
20. K. J. Chalut, J. H. Ostrander, **M. G. Giacomelli**, and A. Wax, "Light scattering measurements of subcellular structure provide noninvasive early detection of chemotherapy-induced apoptosis," *Cancer Research* 69, 1199–204 (2009).
21. C. Amoozegar, **M. G. Giacomelli**, J. D. Keener, K. J. Chalut, and A. Wax, "Experimental verification of T-matrix-based inverse light scattering analysis for assessing structure of spheroids as models of cell nuclei," *Applied Optics* 48, D20 (2009).
22. K. J. Chalut, **M. G. Giacomelli**, and A. Wax, "Application of Mie theory to assess structure of spheroidal scattering in backscattering geometries," *Journal of the Optical Society of America A* 25, 1866–1874 (2008).
23. K. J. Chalut, S. Chen, J. D. Finan, **M. G. Giacomelli**, F. Guilak, K. W. Leong, and A. Wax, "Label-Free, High-Throughput Measurements of Dynamic Changes in Cell Nuclei Using Angle-Resolved Low Coherence Interferometry," *Biophysical Journal* 94, 4948–4956 (2008).

24. **M. G. Giacomelli**, K. J. Chalut, J. H. Ostrander, and A. Wax, "Application of the T-matrix method to determine the structure of spheroidal cell nuclei with angle-resolved light scattering," *Optics Letters* 33, 2452 (2008).
25. **M. G. Giacomelli**, A. S. Hancock, and J. Masel, "The Conversion of 3' UTRs into Coding Regions," *Molecular Biology and Evolution* 24, 457–464 (2007).

Journal Articles In Review

1. T. Yoshitake, **M. G. Giacomelli**, L. C. Cahill, L. M. Quintana, H. Vardeh, B. E. Faulkner-Jones, J. L. Connolly, D. Do, and J. G. Fujimoto, "Rapid histopathological imaging of human skin and breast cancer surgical specimens using immersion microscopy with UV surface excitation". In review at *Scientific Reports*.
2. O. O. Ahsen, H. C. Lee, K. Liang, **M. G. Giacomelli**, Z. Wang, B. M. Potsaid, M. Figueiredo, Q. Huang, V. Jayaraman, J. G. Fujimoto, and H. Mashimo. "Volumetric Assessment of Barrett's Esophagus and Dysplasia by Cross-sectional and En face Ultrahigh-speed Endoscopic Optical Coherence Tomography". In review at *Endoscopy*.

Journal Articles In Preparation

1. **M. G. Giacomelli**, T. Yoshitake, L. C. Cahill, J. Brooker, L. M. Quintana, H. Vardeh, B. E. Faulkner-Jones, J. L. Connolly, and J. G. Fujimoto. "Design of a Virtual Histology Platform for Breast Surgical Margin Assessment Using Nonlinear Microscopy".
2. C. D. Lu, B. Lee, **M. G. Giacomelli**, P. Yiu, and J. G. Fujimoto, "Optical Clocking Group Delay Error Correction in Optical Coherence Tomography."

Patents

1. A. Wax and **M. G. Giacomelli**, "Systems and methods of angle-resolved low coherence interferometry based optical correlation", US Patent 9,335,154.
2. K. Liang, J. G. Fujimoto, H. Mashimo, O. O. Ahsen, H. C. Lee, **M. G. Giacomelli**, Z. Wang, Z., "Scanning optical probe". WO 2015168594 A9.
3. J. G. Fujimoto, **M. G. Giacomelli**, T. Yoshitake, L. C. Cahill, "Method and apparatus for imaging unsectioned tissue specimens". US Patent Application.

Invited Book Chapters and Thesis

1. A. Wax, **M. G. Giacomelli**, F. Robles, "Elastic Scattering Spectroscopy and Optical Coherence Tomography" in *Optical Coherence Tomography, Technology and Applications*, Drexler, W., Fujimoto, J. G. eds. (2015).
2. **M. G. Giacomelli**. "Diagnostic Imaging and Assessment Using Angle Resolved Low Coherence Interferometry" (2012). Ph.D. Dissertation.

Conference Presentations

1. **M. G. Giacomelli**, T. Yoshitake, L. Cahill, Y. Sheykin, H. Vardeh, L. Husvogt, J. Brooker, J. Connolly, A. Cable, J. G. Fujimoto. "Design of a portable, wide field of view, GPU-accelerated multiphoton imaging system for real-time surgical pathology". SPIE Photonics West: Diagnosis and Treatment of Diseases in the Breast and Reproductive System III, San Francisco, Ca (January 2017).
2. **M. G. Giacomelli**, T. Yoshitake, L. Cahill, Y. Sheykin, H. Vardeh, L. Husvogt, J. Brooker, J. Connolly, A. Cable, J. G. Fujimoto. "Nonlinear microscopy for rapid assessment of breast surgical

- specimens". Oral Presentation. SPIE Photonics West: Mini-Symposium: Optical Rapid Ex-Vivo Tissue Assessment II, San Francisco, Ca (February 2016).
3. **M. G. Giacomelli** , T. Yoshitake, L. Cahill, Y. Sheykin, H. Vardeh, L. Husvogt, J. Brooker, J. Connolly, A. Cable, J. G. Fujimoto. "Design of a portable, wide field of view, GPU-accelerated multiphoton imaging system for real-time imaging of breast surgical specimens". Oral Presentation. SPIE Photonics West: Multiphoton Microscopy in the Biomedical Sciences XVI, San Francisco, Ca (February 2016).
 4. **M. G. Giacomelli** , Y. Sheykin, J. Brooker, J. Connolly, A. Cable, J. G. Fujimoto. "Wide area fluorescent lifetime imaging of surgical specimens using two photon microscopy at MHz rates". Oral Presentation. SPIE Photonics West: Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XIII, San Francisco, Ca (February 2015).
 5. **M. G. Giacomelli** , Y. Sheykin, J. Brooker, J. Connolly, A. Cable, J. G. Fujimoto. "Fluorescent Lifetime Imaging of Surgical Specimens Using Two Photon Microscopy at MHz Rates". Oral presentation. SPIE Photonics West: Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XII, San Francisco Ca (February 2014).
 6. **M. G. Giacomelli** , S. Kim, R. Herrmann, S. Heflin, S. Farsiu, V. Arshavsky and A. Wax. "Retinal Cellular Morphology Measurement Using High Speed Two Dimensional Angle-Resolved Low Coherence Interferometry". Oral presentation. SPIE Photonics West: Optical Coherence Tomography and Coherence Domain Optical Methods, San Francisco, Ca (February 2013).
 7. **M. G. Giacomelli**, A. Wax. "Cellular morphology measurement using high-speed two-dimensional angle-resolved low-coherence interferometry". Oral presentation. SPIE Photonics West: Biomedical Applications of Light Scattering, San Francisco, CA (January 2012)
 8. **M. G. Giacomelli**, N. Terry, Y. Zhu, and A. Wax. "Computational Challenges in Development and Clinical Translation of Angle Resolved Low Coherence Interferometry". Oral presentation. Virtual Photonics Workshop, Irvine, CA (August 2011)
 9. **M. G. Giacomelli** and A. Wax. "Determining size, shape, and orientation of non-spherical scatterers using 2D angle resolved low coherence interferometry". Oral presentation. SPIE Photonics West: Biomedical Applications of Light Scattering, San Francisco, CA (January 2011)
 10. **M. G. Giacomelli** and A. Wax. "Multiply Scattered Low Coherence Interferometry (MS/LCI) for extended depth imaging". Oral presentation. SPIE Photonics West: Optical Tomography and Spectroscopy of Tissue, San Francisco, CA (January 2011)
 11. **M. G. Giacomelli**, K.J. Chalut, J. Ostrander and A. Wax. "T-matrix based inverse light scattering analysis using Angle Resolved Low Coherence Interferometry". Oral presentation. SPIE Photonics West: Biomedical Applications of Light Scattering, San Francisco, CA (January 2009)

Funding and Awards

Personal Fellowships

F32-CA183400	Jan 2014-Feb2017
Michael Giacomelli (PI)	
Two-Photon Fluorescence Lifetime Microscopy for Breast and Thyroid Cancer Margin Assessment	

Grants Coauthored

R01-CA178636	June 2013-Present
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James Fujimoto (PI)

Intraoperative real time breast cancer margin assessment with nonlinear microscopy

R01-CA075289

June 2014-Present

James Fujimoto (PI)

Optical Biopsy Using Optical Coherence Tomography

Awards and Honors

2014-2017: NIH F32 NRSA Individual Postdoctoral Fellowship
2015: Invited Lecture, Grand Rounds, Department of Pathology, Beth Israel
Deaconess Medical Center
2007: Google Summer of Code Fellowship
2007: NSF Graduate Research Fellowship Program, Honorable Mention
2006: Graduation with Honors, College of Engineering, University of Arizona

Contact Information

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